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HYGIENE AND METEOROLOGY.

Hygienische Meteorologie. Für Ärtze und Naturforscher Von Prof. Dr. W. J. van Bebber, Abtheilungs Vorstand der deutschen Seewarte in Hamburg. (Stuttgart: Ferd. Enke, 1895.)

NO long preface is needed to prove that meteorology and hygiene have a close and intimate connection, or that the study of both sciences may be mutually helpful. The exhibition of a small death-rate does not exhaust the whole of the problems with which hygiene busies itself. All that tends to ameliorate the condition of the human race, all that ministers to the comfort or promotes the well-being of the individual, is cared for by the student of hygiene. That climate and the phenomena, which we recognise under the comprehensive term "weather," have an intimate connection with the health and comfort of the race, will not be seriously denied, whatever different views may be held as to the precise manner, and to what degree, the condition of the atmosphere can operate on individual cases. Some knowledge of meteorology has hitherto been demanded from candidates for diplomas in sanitary science, public health, or State medicine; and, judging from the rules adopted by the Council, December 1, 1893, the conditions of the examination will in future demand a still closer acquaintance, since the applicant is required to show the possession of a "distinctively high proficiency, scientific and practical, in all the branches of study which concern the public health." To those who seek something more than a bare superficial knowledge of meteorology, this book will be very welcome, and not only to those who desire diplomas, but to the larger, though less specially instructed, class who desire the welfare of the human family.

Coming from one the direction of whose scientific studies is distinctly meteorological, it might be anticipated that the book would deal more with this subject than with hygiene; and to some extent this is the case, and possibly the interest in the book will on this account be diminished. We have a collection of facts, admirably arranged, though drawn, of course, mostly from German sources; and such a collection will be of the greatest value to some student of sanitary and social science, who, trained in physiological schools, will produce a work of greater interest, more closely connected with the spread and mitigation of disease as affected by climate or meteorological conditions of a more or less temporary character. In one important respect, however, the book deviates from the generality of meteorological treatises, and at the same time removes an objection which has frequently been urged by physicians, who assert that weather statistics are not given in the form which is most convenient or most instructive. To take a mean of his observations is too frequently the sole aim of the meteorological observer, and consequently mean results for temperature, for example, are given, where the range of variation is the more important element from the medical point of view. This fact is fully recognised by the author, and he deals not only with the mean values, but also with the amount of variation from the arithmetic mean and the frequency with which such variations occur.

The book is divided into eight sections. The two first treat of the physical properties and of the various ingredients of the air. Elementary physics characterises the first, chemistry the second. In this latter section are described somewhat fully the gases which enter into the atmosphere, not excepting those which are present in minute quantities. Accidental ingredients, such as dust and micro-organisms, are also considered. One does not meet with anything very new, but the facts are well and pleasantly arranged, and would give any student all the information necessary for fully comprehending the successive chapters. It might have been expected that the constituents of water would have been treated with the same degree of fulness. Free oxygen in water may not be of the same importance as in the air, but the aëration of water is not insignificant, whether regarded as an important withdrawal from the atmosphere itself, or the part it plays in the oxidation of organic material, be it in the form of ozone or hydrogen dioxide, or other efficient oxidiser.

The chapter on Temperature is admirable. From a vast collection of material with which intimate study has made the author closely familiar, he is able to systematise and arrange those facts which have the greatest and most obvious bearing on the subject. It is a graphic digest of all that affects the temperature of the world, and is amply illustrated by tables compiled from many sources. We wish we could pay him a compliment on his maps. In the map on page 110 it is only with great difficulty that Europe is recognised, and the one on page 174 is very little better. The tables are, however, so very well arranged, that this slight defect is of little consequence.

As an illustration of the minuteness into which the author enters, we may quote the measures of the temperature of different parts of clothing when worn. The figures have been reduced to Fahrenheit scale, in which form, if less scientific, they may be of use to some of the commercial firms who are interested in such matters.

	Temp. 50°	Temp. 79°
Temp. on the coat	71°·2	82°·4
,, between coat and vest ...	73·6	83·8
,, ,, vest and linen shirt	75·9	84·7
,, ,, linen shirt and woollen shirt ...	77·4	85·3
,, ,, woollen shirt and skin	90·9	89·8

The loss of temperature which the body experiences at a temperature of 59° is diminished by clothing in the following proportions:—

Radiation from the bare skin	100
,, when covered with wool	73
,, when covered with wool and linen ...	60
,, when covered with wool, linen, and vest	46
,, when fully dressed	33

It does not appear whether the velocity of the wind has been taken into account in deriving these figures. The importance of clothing comes, however, again to the fore

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as affected by moisture, where the author computes and illustrates the amount of heat abstracted from the body in order to convert into vapour the water which a saturated suit of clothes is capable of containing.

This latter remark has reference naturally to the chapter on Precipitation, which, with the following one on Thunder-storms, does not call for any special remark. Emphasis is laid on the purifying influences that rain and snow have on the atmosphere ; but little is said, perhaps, because little is known with certainty, of cleansing influences on water. The question how far water once contaminated can be restored to its original organic impurity, without the processes of evaporation and reprecipitation, has exercised the minds of chemists and sanitarians in this country with some severity. Information is still necessary both as to the processes at work and the agents by which impurities are removed, as they admittedly are, by some self-cleansing method. The author is understood to recommend filtration as especially necessary to eliminate (*auszuscheiden*) bacteria, presumably bacteria of a pathogenic character. He does not seem to recognise the fact, if it be a fact, that a filter-bed covered with bacteria has still the power of arresting in a very considerable degree the bacteria in the water that filters through it. How this is accomplished is another matter, which may not concern meteorology, but the large questions of sedimentation and percolation of water in its passage through the ground comes naturally into the treatment by Dr. Bebber, more especially as he enters with some degree of detail into ground water, and the conditions which make it potable or otherwise.

Wind and the motion of cyclones are subjects that the author has made peculiarly his own, and are dealt with here at considerable length. Considering the important results that follow the transport of masses of air from place to place, and the mingling and purification of the atmosphere that is thus effected, it is not suggested that the subject receives an undue amount of attention. The connection between cyclonic paths (*Zugstrasse*) and hygiene, however, is not so immediately evident; but the subject is one that has long interested Dr. Bebber, and he naturally has much to say. It is meteorology pure and simple, and has this defect, that it is scarcely full enough for the student of that science, and in too great detail for the sanitarian.

Perhaps the most interesting chapter in the book is the last, on Climate, and in which is treated diseases under various climatic conditions. On page 275 is given a table showing the annual mortality per thousand in various parts of the world. This table is apparently thrown together haphazard, and does not exhibit that careful arrangement by which Dr. Bebber in other parts of his book has illuminated his work and instructed the student. But the bald facts, as written down, gain by that very absence of symmetry, and are both interesting and gratifying. It is true, as the author is careful to point out, that the facts have been gathered under very various circumstances, under various authorities and systems, and are not strictly comparable ; but making every allowance for inexact compilation, they do exhibit a manifest improvement in the health of nations, and bear a gratifying testimony to the successful study and practical enforcement of sanitary laws. The few samples we can extract illustrate best the increased adaptibility of individuals to meet those conditions that are generally regarded as adverse to health and longevity. Take the case of British troops in India :

From 1800-1830.	Annual death rate per thousand ...	84·6
,, 1830-1856.	,, ,, ...	57·7
,, 1869-1878.	,, ,, ...	19·3
,, 1879-1887.	,, ,, ...	16·3

From the West Indies the evidence is of the same character :

From 1820-1836.	European Troops,	Jamaica,	Mortality	121
,, 1817-1846.	,, ,,	West Indies	,,	75
,, 1879-1887.	,, ,,	Jamaica	,,	11·0
,. 1820-1836.	Negro Troops,	Jamaica	,,	30·0
,, 1879-1887.	,, ,,	,,	,,	11·6

On the Gold Coast, the figures are so remarkable that that they can only be explained by supposing some different method of computation to have been employed in the two circumstances:

From 1829-1836.	European Troops, Gold Coast ...	483 ! !
,, 1879-1885.	,, ,, ,, ...	68

Possibly a similar source of error will explain the only retrograde case to be met with, for which the insalubrious climate of Cayenne is responsible :

From 1819-1849.	Troops, Mortality	27·2
In 1855	,, ,, ...	90·8

Of course some of these beneficent results may be attributed to greater care in the selection of men to be sent to these regions ; but it would be distinctly wrong to deny also that much is due to insistence on improved conditions of residence, of clothing, of food and drink, especially in the maintenance of uncontaminated sources of drinking water, in fact an insistence on those conditions which sanitary science has shown to be of the utmost importance to individuals and nations.

Possibly, enough has been said here to show that we have to do with a very interesting book, and one far reaching in its aims. If we have to make any complaint, it is only to express the regret that it is not more so. It is the omissions that are sometimes disappointing, the contents never are. We give, in conclusion, one last illustration. Remembering that the book is issued from Hamburg, and that this town suffered severely from the scourge of cholera in 1892, one cannot but feel that the Observatory is in possession of facts which could not but be of interest in discussing the vexed question of the spread of this disease. Beyond the slightest possible mention on p. 287, the author does not refer to it. Yet it is suggested that he could have told us authoritatively what meteorological conditions coincided with the greatest spread of the disease, that he could have given us details of the temperature of the ground and of the Elbe water (see p. 147) that presumably favoured the increase of the bacillus, if it did not come within his province to discuss any differences of morphology, of virulence, or reproductive faculty in the vibrio.

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